IMPERIAL COUNTY AIR POLLUTION CONTROL DISTRICT
150 S. Ninth Street
El Centro, CA 92243
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DRAFT: 8/31/98
Permit No.: 1641

MAJOR FACILITY PERMIT REVIEW

Company Name: Ogden Geothermal Operations, Inc.

Facility Name: Heber Geothermal Company and Heber Field Company.

SIC Code: 4911 (Electric Services)

Source Type: Geothermal Power Facility
Location: 895 Pitzer Road, Heber, CA 92249
Responsible Official: Robert C. Sones

Plant Site Contact: Sergio Cabañas

Permit Reviewer: Reyes Romero

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I. Introduction

Pursuant to Rule 900, of the Imperial County Air Pollution Control District Rules and Regulations, the District intends to issue a Title V Operating Permit to Ogden Geothermal Operations, Inc. This company operates Heber Geothermal Company (HGC) and Heber Field Company (HFC). The facilities operate under District's permits number 1641 and 1500A. The facilities will operate under Title V Operating Permit number 1641. The Operating Permit will include conditions to ensure that all Federal, State and District requirements are satisfied.

II. Project Description

Heber Geothermal Company and Heber Field Company have been in operation since 1985. The steam/brine production and transportation are supplied by HFC. HGC is a dual-flash-cycle geothermal power plant rated at 52 MW

(gross), 47 MW(net). Electrical power generation is accomplished by bringing hot brines to the surface via production wells for extraction of heat and further reinjection of the residual brine.

The Heber brine, produced from wells of the HFC, has a salt content of approximately 14,000 ppm and dynamic wellhead pressure and temperature of approximately 25 to 60 psig and 250-300°F. The steam/brine source of supply consists of 11 slant-drilled wells. The wells are drilled to a depth of 6,000 to 10,000 ft.

Upon entry into the plant, the two-phase flow of brine and steam enters the auxiliary flash tank. Within this vessel, the first crude separation of the high-pressure steam from the high-pressure brines takes place by gravimetric means. From mirrored outlets of the auxiliary flash tank, both the steam and the brine are separated into two 50 percent capacity trains. The high-pressure steam enters a pair of high-pressure flash tanks. The steam flows down an internal pipe and exits from the bottom of the high-pressure flash tanks and is conveyed to the turbine high-pressure steam inlets.

High-pressure brine is removed from the bottom of the auxiliary flash tank and flows through hot water collecting tanks to the low-pressure flash tanks. The hot water collecting tanks act primarily as small surge vessels for stabilizing the pressures and brine levels in the high-pressure portion of the flash system. The pressure drops from the high-pressure system to the low pressure system and hence "flashing" occurs. Two wells, HGU 13 and 14, are linked directly to the low-pressure flash thanks. The low-pressure steam flows through a manifold of steam lines for admission to the turbine.

The steam turbine, manufactured by Mitsubishi Heavy Industries (MHI), is a dual-entry double-flow design with five stages of rotating blades in each flow direction and a rated output of 52 MW. The exhausted steam is directed down into the condenser installed directly under the turbine/generator unit.

The heat rejection system for the power plant is a conventional closed loop recirculating water system, using a surface condenser and mechanical draft cooling tower. The induced draft cooling tower is five-cell counterflow design. The cooling tower fill is PVC and utilizes the film cooling heat transfer mechanism. Five 200 HP fans provide the updraft for the tower. Makeup water to the cooling tower is obtained from irrigation canals during peak generating hours and from the condensers hot well during non-peak hours and on holidays and weekends.

Brine from the low-pressure flash tank flows by gravity to the brine return surge tanks below the flash tanks. The brine is pumped across the northern edge of the plant site to injection wells.

III. Air Emissions:

The geothermal plant has the following points of emission to the air: cooling tower noncondensable gases, cooling tower drift, and fugitive emissions from valves and flanges.
The cooling tower gases are composed mostly of the following substances: carbon dioxide (approximately 82%), nitrogen (approximately 9%), and methane (approximately 4%). Less than 5% of the cooling tower gases contain regulated toxic substances; mostly ammonia (approximately 4%) and less than 1% hydrogen sulfide, benzene, mercury, radon, toluene, and xylene. The non-condensible gases are vacuumed from the condenser and routed to the cooling tower cells where the gases are dispensed to atmosphere. Some gases

dissolved in the condenser's water can be oxidized to salts or possibly air stripped by the cooling tower.

The condensate contains small amounts of brine carryover from incomplete phase separation in the flash train and H2S and NH3 which are soluble in water. The following substances have been detected in the circulating water: ammonia, hydrogen sulfide, manganese, and zinc. Since all of these substances are solubles in water, they are emitted as drift, with exemption of H2S and ammonia which are emitted as gases. No detectable levels of arsenic compounds, beryllium, bromide compounds, cadmium compounds, chromium (hexavalent), copper, lead compounds, mercury, nickel, radon, and selenium compounds were found in the previous Toxic Hot Spot testing of the circulating water.

The geothermal facility also maintains one standby fire pump, driven by a diesel engine.

IV. Current Emission Status:

The Heber Geothermal Company and its wells have a potential to emit benzene, a hazardous air pollutant (HAP), in amounts that exceed 10 tons per year. The facility also has the potential to emit methane, a pollutant regulated under Section 112(r) of the CAA, in amounts that exceed the major source threshold of 100 tons per year.

V. Applicable Requirements

According to the information submitted in the Title V application and the District review, the following are the Federal, State, and District requirements that apply to the facilities.

Applicable Requirement	Enforceability	Equipment Affected
Rule 111-Equipment Breakdown	Federal, District	All Equipment
Rule 117-Nuisances	Federal, District	All Equipment
Rule 201-Permits Required	Federal, District	All Equipment
Rule 202-Exemptions	Federal, District	All Equipment
Rule 207-Standards for Permit to Construct	Federal, District	All Equipment
Rule 401-Opacity of Emissions	Federal, District	All Equipment
Rule 403-Quantity of Emissions	Federal, District	All Equipment
Rule 405-Sulfur Compounds	Federal, District	All Equipment
Rule 126-Sulfur Content of fuel	Federal, District	Diesel Equipment
CAA Section 112(r), 40 CFR Part 68, Risk Management Plan	Federal, District	HGC
40 CFR, Part 82, Stratospheric Ozone Protection	Federal, District	Air Conditioning
Rule 900-Operating Permits	Federal, District	All Equipment
NSR ATC Permit 1641 Cond 4 - H2S<250 lbs/day	Federal, District	HGC
Conds 1,2,3,5,6 Monitoring and Notification	Federal, District	HGC
NSR ATC Permit 1500A Cond B - H2S < 10 lbs/hr	Federal, District	HFC
Rule 517-Emergency Variance	State and District	All Facility
AB2588-Toxic Hot Spots Program	State and District	All Equipment

VI. Statement of Basis

The proposed Operating Permit includes conditions to ensure that all Federal, State and District requirements will be satisfied. Additionally, the permit has been designed to have adequate monitoring, record keeping and reporting requirements to demonstrate continuous compliance with the permit conditions.

The following provides additional clarification regarding certain permit conditions.

1. Authority to Construct 1500A Enforceability for HFC.

Original ATC permit was issued to Chevron Geothermal Company of California in December 4, 1986. New geothermal wells were included to the ATC permit in 1991 and the conditions of the ATC permit were amended to 1500A. This Permit was transferred to Heber Field Company in August 24, 1993. The amended ATC permit became federally enforceable because it consolidates the geothermal wells that are operated for Heber Geothermal Company.

2. Authority to Construct Permit Requirement Exemption.

Authority to Construct permit 1500A, condition D, requires Heber Field Company to conduct analysis of brine and steam for a list of 13 compounds. This requirement does not come from any Federal, State or SIP District regulation. The facility has requested exemption from this requirement based on the unnecessary and outdated status of this requirement (DRAFT California White Paper for Title V Implementation, October 25, 1995). The analysis of most of these compounds is required by the AB2588, the California toxic Hot Spots Program; however, these compounds will be monitored at other points of the process. Hydrogen sulfide is the only compound regulated by a federal or District limit, ATC permit 1500A, condition B. A partial exemption will be granted to Heber Field Company from condition D, ATC Permit # 1500A, to suspend the monitoring of 12 compound. The facility will continue to conduct analysis of hydrogen sulfide as required by this condition.

The ATC Permit 1500A Condition D will be amended following the District's NSR procedures. Public notice of this amendment will be published along with the Operating Permit. Condition D will be amended to read as follows:

a) Heber Field Company shall conduct analysis of hydrogen sulfide for each well. Each well shall be sampled at a point prior to delivery or emission to the atmosphere. Analysis for each well shall be conducted on an annual basis.

3. Hydrogen Sulfide Emission Limit for HGC.

Hydrogen sulfide is emitted to the atmosphere through the cooling tower and fugitive emissions from valves and flanges. Condition 2.2.5.1 of the Operating Permit establishes a limit of 250 lb/day for total emission of hydrogen sulfide for HGC. Compliance with this limit will be monitored monthly.

The exhausted steam from the turbine is transferred to the surface condenser where the gases will partition into the gas phase and condensate. The mass flow rate of hydrogen sulfide will be calculated as the sum of emissions from the noncondensable gas line and the condensate.

The majority of the gases are extracted from the condenser via the noncondensable gas line and transferred to the cooling tower; here, they

mix with the air and water and are released to the atmosphere. The hydrogen sulfide emissions at this point will be quantified by multiplying the mass flow rate of noncondensable gases by concentration determined from the sample analysis.

A fraction of the hydrogen sulfide is expected to partition into the condensate. The condensate is used for the make up water to the circulating water system during the months of October through May and on weekends and holidays the rest of the year. Hydrogen sulfide in the condensate is emitted from the cooling tower as a gas. The rest of the year the condensate is discharged to the drain and not routed to the cooling tower. The hydrogen sulfide in the condensate is partially oxidized prior to being exolved from the circulating water. The hydrogen sulfide that partitions into the condensate is quantified by sampling the condensate line, measuring condensate flow, and using a factor to account for oxidation. The oxidation rate will be evaluated by source testing the cooling tower exhaust. The oxidation rate obtained from the most resent source test will be used. A source test was conducted to evaluate hydrogen sulfide oxidation rate on May 27 and 28, 1998 by Thermochem Laboratory and Consulting Services. The cooling tower exhaust was tested using Northern Sonoma County APCD Method 102 for determination of hydrogen sulfide content in geothermal power plant cooling towers. An oxidation rate for hydrogen sulfide of 86.66% was obtained.

The fugitive emissions from valves and flanges are not reported monthly due to the impracticability of quantifying this type of emissions.

4. Quantity of Emissions

Rule 403, Quantity of Emissions, prohibits the release of air contaminants into the atmosphere from any single processing unit in excess of 0.2 grains per cubic foot of gas. This limit is addressed in the Operating Permit by Condition 2.2.2 and it will be monitored quarterly. This limit will apply to the release of gases from the cooling tower which includes noncondesable gases plus any volatile pollutants separated into the condensate (H2S and NH3) when condensate is used for the make up water. Compliance with this limit will be determined by dividing the mass flow rate from the noncondensable line plus the fraction of volatile in the condensate, in pounds per hour, by the air exhaust flow rate (cu.ft/min) in the cooling tower. The emission of noncondensable gases will be quantified by measuring the gas flow rate at the noncondensable gas line. The emission of volatile pollutants that separate into the condensate will be quantified by sampling the condensate line and measuring the condensate flow. The oxidation rate obtained from the most recent source test for the cooling tower exhaust will be used to evaluate the H2S emissions in the condensate.

5. Hydrogen Sulfide Emission Limit for HFC.

Operational wells will be occasionally vented to the atmosphere via the emergency vent stack or rock muffler. The steam delivery system provides for venting the wells via the emergency vent stack to heat-up the lines after shutdown of the wells due to unscheduled outages or scheduled maintenance. The geothermal wells are also vented via the rock muffler due to overpressure, a turbine trip, or plant shutdown. Emission of hydrogen sulfide due to venting of the geothermal wells will be limited to a maximum of 10 lb/hr during three or more distinct hourly periods within any calendar year. This limit is addressed in the Operating Permit by condition 2.2.6.1. Each well will be sampled and analyzed for concentration of hydrogen sulfide on an annual basis.

The emission of hydrogen sulfide via the emergency vent stack will be calculated by multiplying the maximum steam flow rate in the line times the concentration determined from the sample analysis. The time during which the atmospheric venting of the wells occurred will be monitored and recorded in order to determine compliance. The steam flow rate will be calculated by remeasuring the hourly steam flow rate by tracer/dilution techniques. The steam flow rate obtained from the most recent test will be used.

Emissions of hydrogen sulfide due to atmospheric venting of the wells via the rock muffler will be calculated by multiplying the steam flow rate times the concentration determined from the sample analysis. The time during which the atmospheric venting of the wells occurred will be monitored and recorded in order to determine compliance.

VII. Insignificant Activities

The following types of activities and emission units were exempted from the Title V permit requirements.

1. Diesel-driven equipment for well reworking, cleaning, and other maintenance activities in the HFC well field are considered nonroad engines according to the definition on 40 CFR Part 89.2.

2. Three 250-gallon Diesel storage tanks. Rule 202.E.8.c exempts equipment used to store unheated organic liquid with an initial boiling point of 150°C or greater. The initial boiling point for diesel is 232°C.

3. Solvent cleaning stations. Rule 202.E.9.b exempts unheated nonconveyorized cleaning equipment with a surface area less than 1.0 sq.m., using organic solvents with an initial boiling point of 160°C or greater, and losing less than 25 gal/yr of solvent to the atmosphere. The solvent used at the cleaning station has an initial boiling point of 177°C, the area is smaller than 1 sq.m., and loses are less than 25 gal/yr.

4. GM Detroit Crane, Model 8.21; mobile lighting; Lincoln welding unit. Rule 202.E.11 exempts routine maintenance and repair equipment.

5. Back up fire pump, 290 HP diesel driven engine. Fire suppression systems are considered trivial activities according to guidelines of Title V Operating Permit Program Submittal, attachment "C," of the ICAPCD.

VIII. Supplemental Annual Fee

The supplemental annual fee for the facilities will be determined according to the guidelines of Rule 900.G. The supplemental annual fee will be calculated according to the following equation:

s = [$ 32.65 per ton (CPI adjusted) x e] - f
where:

s =supplemental annual fee in dollars
e = fee-based emissions in tons per year

Actual rates of emissions for which fee-based emission schedule applies:

Hydrogen Sulfide (1996 inventory) = 24.4
Benzene (1995 inventory) = 16.2
Total `40.6

f = sum (in dollars) of annual fees under Regulation III and AB2588:

Heber Geothermal Company = $ 7,050.00
Heber Field Company = $ 3,360.00
AB2588 = $ 107.00

TOTAL = $10,517.00

Total Emissions of Fee Pollutants:	40.6 tons/yr
Emissions of Fee Pollutants x $ 32.65/ton:	$ 1,325.59
Annual Fees under Reg.III and AB2588	$ 10,517.00
Estimated supplemental Title V Program Fee:	(1,325.59-10517.00) = $ 0.00

These calculations indicate that the annual fee paid by the facilities under Regulation III and AB2588 exceeds the emission fee pollutant schedule under Rule 900 therefore no supplemental fee is required.